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ABSTRACT

Three basic designs for studying college student attrition are described and the comparative assets and liabilities of each are discussed. It is noted that administrators faced with declining enrollments and costs for students not completing degree programs are likely to call for attrition studies, yet methodological inadequacies exist in many "local" or single-institution studies. The three basic designs--"autopsy," cross-sectional, and longitudinal designs--are evaluated with respect to such considerations as likely response rates and sample representativeness, controls for confounding variables, desirable analytical procedures, time-lines, relative costs, and applicability of data to other purposes. The information provided is intended to facilitate the cost-benefit judgments inherent in the decision to undertake an attrition study by highlighting the research and practical trade-offs required by the selection of a particular design. (Author/JMD)

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AN EVALUATION OF THREE BASIC DESIGNS
FOR STUDYING ATTRITION

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ABSTRACT

Several researchers have called attention to methodological inadequacies in many "local" attrition studies. Given the current concern with maintaining stable enrollments, however, it seems likely that administrators will continue to call for studies of attrition on their campuses. This paper describes three basic designs for studying college student attrition and discusses the comparative assets and liabilities of each. "Autopsy," cross-sectional, and longitudinal designs are evaluated with respect to such considerations as likely response rates and sample representativeness, controls for confounding variables, desirable analytical procedures, time-lines, relative costs, and applicability of data to other purposes. The paper is intended to facilitate the cost-benefit judgments inherent in the decision to undertake an attrition study by highlighting the research and practical trade-offs required by the selection of a particular design.

AN EVALUATION OF THREE BASIC DESIGNS FOR STUDYING ATTRITION

In the face of projected enrollment declines, legislators and higher educational administrators and planners find little solace in the evidence suggesting that national four-year attrition rates have held relatively constant around 50 per cent over the last fifty or sixty years (Summerskill, 1962; Astin, 1975). While some attrition is inevitable, and some may even be desirable (leading to, or reflecting, positive developmental benefits for some students), the fact remains that federal, state, institutional, and individual resources are invested in students who ultimately do not complete a degree program as well as in those who do. To the extent that some students would like to remain in school but cannot, and to the extent that the reasons for discontinuance are within the sphere of federal, state, or institutional influence, then such investments may represent both misexpended resources and neglected educational responsibilities.

Several excellent reviews of the attrition literature exist (Spady, 1970; Tinto, 1975; Cope & Hannah, 1975; Pantages & Creedon, 1978), but these reviews, and various national studies, useful as they are for general understanding of the attrition phenomenon, in no way obviate the need for "local" research. Indeed, recent federal regulations requiring institutions to provide applicants with information about institutional completion rates can reasonably be expected to increase, rather than diminish, the number of "local" attrition studies. It seems equally likely that many administrators will not be content simply with knowing how many students drop out, but will also want information about why students withdraw. Yet single-institution studies have been roundly criticized as methodologically uneven, as based on inadequate definitions, designs, sampling plans, instruments, and analytical procedures.

Program or policy action based on unreliable or invalid research may be less effective than that rooted in administrative intuition. If campus officials

are to conduct useful attrition studies--or be informed consumers of the research of others--there appears to be some need for a comparison of the relative strengths and weaknesses, costs and benefits, of the various designs and methods available for studying attrition. This paper attempts to meet that need, at least in part, by 1) describing three basic designs for studying college student attrition--the "autopsy," cross-sectional, and longitudinal designs, and 2) evaluating the assets and liabilities inherent in each.

Some Preliminary Considerations

Before selecting a suitable study design, careful attention needs to be given to what is meant by "attrition." The definitional task is complicated by the wide variety of types of dropping out and by the frequent hybrids of common types. For example, dropping out may be: 1) systemic (i.e., a complete cessation of postsecondary education) or institutional (withdrawal from one institution, but enrollment at another with, perhaps, no interruption in studies); 2) temporary (the so-called "stopout") or permanent; 3) forced (the academic dismissal) or voluntary; or 4) unanticipated (i.e., no pre-enrollment expectation of dropping out) or planned (e.g., when specific, non-degree, educational or personal goals have been accomplished). There is ample evidence of behavioral and attitudinal differences among students across the various types (Prediger, 1965; Rose & Elton, 1966; Rossman & Kirk, 1970).

The problem of selecting clear, exhaustive, and mutually exclusive definitions is compounded by considerations of the population of students under study (Is attrition at a single, several, or all class levels to be studied?), and by the time period covered by the attrition rate (Is one concerned with attrition after one semester? a year? four years? ten years?) Resolution of one issue may limit alternatives in the other. For example, Eckland (1964), Sexton (1965), and Pantages and Creedon (1978), among others, suggest that most students who withdraw do so before the start of the

sophomore year. Yet studies of freshman attrition will provide no information about the influences on dropping out over different classes or a longer time period.

The design descriptions and assessments that follow assume that survey research methods, using questionnaires rather than personal interviews, will be employed, although the latter are not precluded.¹ Although it is also assumed that studies will probably be based on random samples of students, smaller institutions may seek to survey whole populations. Finally, the evaluations assume single-institution studies; adaptations to larger systems will be more ones of scale than of conception.

The three attrition study designs are evaluated in light of two major classes of issues, "Research Considerations" and "Planning Considerations." Each of these classes comprises a set of more specific points to be taken into account in selecting the most appropriate design for a study, given the questions to be answered and the constraints imposed by available resources. "Research Considerations," viewed here as analogs to the "benefits" portion of the cost-benefit equation, refer to those methodological properties one would seek to maximize if there were no limit on time or resources. "Planning Considerations" refer to the "cost" areas to be taken into account as research objectives are balanced against the limitations on time, personnel, money, and other resources. Table 1 summarizes each design's evaluation in these general areas and outlines the compromises inherent in selecting a particular research design.

In Table 1, "Instrument Reliability" and "Instrument Validity," listed under Research Considerations, are clearly more matters of measurement than of design. Choice of a design neither precludes nor guarantees adequate instrumentation, and the quality of a measure is more closely related to the knowledge and skill of the researcher than to the design selected. They are included nonetheless because they are important considerations in any research.

¹"Exit interviews" are not discussed 1) because their primary purpose is normally more for counseling than research, and 2) because most dropouts appear to leave between, rather than within, semesters and often without notice of their departure.

TABLE 1

SUMMARY EVALUATION OF THREE DESIGNS
FOR STUDYING ATTRITION

Consideration	Autopsy Studies	Cross-Sectional Studies	Longitudinal Studies
<u>Research Considerations: (Benefits)</u>			
Instrument Reliability ^a	Probably Limited	Possible	Possible
Instrument Validity ^a	Probably Limited	Possible	Possible
Likely Response Rates	15-40%	55-80%	40-60% ^b
Sample Representativeness	Unlikely	More Likely	More Likely
Internal Validity			
a) Comparisons with Non-dropouts	No	Yes	Yes
b) Controls for Initial Group Differences	No	Limited ^c	Yes
Analytical Procedures	Usually Descriptive or Bivariate	Bivariate or Multivariate	Multivariate
<u>Planning Considerations: (Costs)</u>			
Needed Training/Experience of Project Staff	Minimal	Moderate to Advanced	Advanced
Time to Complete Study	3-5 mos.	6-9 mos.	15 mos.
Direct Costs (Relatively)	Low	Low-Moderate ^d	High ^d
Planning Needed	Limited	Limited-Moderate	Considerable
Applicability of Data to Other Purposes	None-Limited	Moderate-High	Moderate-High
Data Management Problems and Requirements	Few	Few-Moderate	Moderate-Many

^aDepends more on the training and skill of the person(s) designing the study than on the design adopted.

^bResponse rates, expressed as proportions of an initial sample, decline with each subsequent data collection.

^cAssumes that the only pre-college information available for study respondents is that typically collected at time of application for admissions (e.g., sex, academic aptitude, percentile rank in high school class, but not including educational aspirations or goals, commitment to completing a degree, personality characteristics, and similar information).

^dCosts may be reduced considerably if an institution regularly collects extensive pre-college data through such programs as the Cooperative Institutional Research Program (UCLA- & ACE-sponsored) or the ACT Assessment Program.

"Autopsy" (sometimes called "retrospective") studies involve an after-the-fact survey of the reasons dropouts give for discontinuing their studies. Under this design, dropouts (either in a single class or college-wide) are identified and sent a questionnaire on which they describe why they left school, and sometimes their college experiences and their evaluations of institutional programs and services.

The autopsy design affords an opportunity to learn in students' own words why they withdrew, what might have induced them to remain, their current activities, and their future educational plans. Moreover, one can separate those students who dropped out because of some problem or dissatisfaction, from those who had accomplished their educational goals. Compared to the other designs to be discussed, only the autopsy study offers such opportunities.

This design seems straight forward enough: if you want to know why students drop out, ask them. Despite its common sense appeal, however, its liabilities far outnumber its assets. Instrument reliability cannot easily be assessed since most of the questions are typically written to stand alone, not to be grouped together in factors or scales that reflect in a more stable manner some behavioral or attitudinal dimension that may be related to attrition. Instrument validity is also probably compromised: students who have left an institution may feel some need to rationalize their decision, to make it socially, even personally, acceptable (e.g., Knoell, 1966; Fenstemacher, 1973).

In addition to these problems, response rates in post hoc studies are notoriously low, not infrequently below 30 or 40 per cent. While a low response rate is not in and of itself a threat to a study's generalizability, response rates are directly related to the likelihood of response representativeness: the lower the response rate, the less likelihood of respondents being representative of the larger population from which they come. As Fenstemacher's (1973) data indicate, this unrepresentativeness may mislead both on the personal characteristics

of dropouts (e.g., sex) and on their evaluations of their college experiences (likely to be biased in a positive direction). Thus, generalizability is seriously jeopardized.

Moreover, as Campbell and Stanley (1963) have noted: "Basic to scientific evidence...is the process of comparison, of recording differences, or of contrast... Securing scientific evidence involves making at least one comparison" (p. 6). This notion of controlled comparison is fundamental to any research design's internal validity--the capability of the design to assure that an observed relation (e.g., between academic major and attrition) is not a spurious one. Basically, there are two methods by which internal validity may be enhanced: 1) through the random assignment of persons to experimental and control groups, or 2) through the use of a non-equivalent "comparison" group with the adoption of statistical controls (including factorial designs) to take initial group differences into account.

While no attrition design can use random assignment, only the autopsy study design (of those discussed here) also fails to provide for a group of non-dropouts with whom the dropouts can be compared in the search for variables that are related to attrition.¹ In the absence of a comparison group, one can only describe dropouts' characteristics, attitudes or behaviors--traits that may or may not be similar to those of non-dropouts. And clearly, without a comparison group, statistical controls become meaningless.

Finally, while it is not a weakness inherent in the design, autopsy studies typically rely on frequency distributions and cross-tabulations for statistical description of results. When statistical tests are made, they are most frequently based on bivariate procedures--testing relations between two variables. While these conditions are more often than not related to the statistical training and

¹Data can be collected from non-dropouts, although they rarely are. Such information is likely, however, to be gathered at different times and under different conditions than that provided by dropouts.

experience of the researcher, they are nonetheless incapable of taking into account the complex series of interrelations which one senses intuitively underlie the attrition process. Repeated bivariate tests can be misleading. Indeed, Spady (1970) recommends that "...further...bivariate research on the 'correlates' of dropping out should be abandoned. Now!" (p. 77).

If the research assets of the autopsy design are meager, the planning considerations and costs are correspondingly minimal. The training and experience required to conduct such a study are modest compared with the other two designs to be discussed. Administrative ability is needed to coordinate the development and production of a questionnaire and the other tasks inherent in survey research, but the services of a full-time researcher are not required, although short-term consultation with someone familiar with statistics and survey research techniques (e.g., a social science faculty member) probably would be useful.

Furthermore, since only one data collection is normally involved, the time necessary to collect and analyze the data is relatively brief. Probably no more than five or six months will be needed (six to eight weeks for data collection).

Direct costs, such as postage, computing time, materials, and printing expenses are also relatively modest, particularly in comparison with a longitudinal design. The major cost will most likely be first class postage.

Similarly, the amount of planning and organizing for an autopsy study are limited. Once the questions to be asked have been specified, the survey procedures to be followed are relatively simple and straight forward. (See Bower & Myers (1976) for an excellent description of survey procedures.)

Information collected using an autopsy design also probably has limited use for planning or evaluation purposes other than those associated with attrition. The limitations proceed from the absence of a comparison group of non-dropouts, the fact that most autopsy data are collected after the students have withdrawn, and from the questionable validity of obtained responses.

As used here, "cross-sectional design" refers to the collection of data from currently enrolled students at a single point in time, probably late in an academic year. Information is sought concerning students' educational, personal, and social attitudes and experiences, and those respondents who fall into various categories of dropouts and non-dropouts are identified after the start of the next academic year. These groups are then compared on the variables thought to influence attrition decisions and for which data have been collected.

Despite the fact that instrument reliability and validity depend far more on the training and skill of the researcher than on the design selected, the cross-sectional plan is still more likely than the autopsy design to yield valid responses since, in the case of leavers, there is less reason to rationalize a decision that has not yet been made (or at least not yet carried through). As noted earlier, however, no design either guarantees or precludes adequate measurement.

Cross-sectional designs are also, other things being equal, more likely than autopsy studies to have higher response rates, if for no other reason than that the students being surveyed are still enrolled and therefore more accessible to the researcher. Students who have decided to withdraw may not respond as readily as those who will stay, but response rates from enrolled students exceeding 50 per cent are not unusual and may run as high as 75-80 per cent.

The relation between response rate and respondents' representativeness for a larger population has been described. It is worth repeating, however, that while neither high response rates nor random sampling is any guarantee of respondents' representativeness, the probability of results being generalizable increases with the rate of response. Despite the possibility of a lower response rate among future dropouts, alluded to above, response representativeness is still more likely with a cross-sectional design than with the autopsy plan.

In the matter of internal validity, the autopsy study failed on two counts:

the absence of a comparison group of non-dropouts, and the consequent inability to test or control pre-college differences between students who drop out and those who do not. The cross-sectional design has a clear advantage over the autopsy plan in that it provides for the direct comparison of dropouts with non-dropouts on the same measures, taken at the same time, and under similar conditions. In addition, this design involves the measurement of potentially attrition-related experiences and attitudes at the very time they are presumably exerting their influence (Pantages & Creedon, 1978).

Threats to the internal validity of the cross-sectional design remain, however. Despite its provision for a comparison group, it generally does not allow the testing or control of initial group differences. Thus, to the extent that dropouts and non-dropouts may have been different at the time of enrollment, it may be possible to attribute the attrition decision to those differences, rather than to something in the institutional environment or experience of the students. Students' admissions files may contain some information useful for controlling pre-college differences, but the opportunities for such controls are probably limited to the information available in the files; information relating to such potentially important predictors of attrition as pre-college commitment to completion of a degree, personality traits, educational and career aspirations or goals, and expectations of the college experience probably will be unavailable. Thus, while the cross-sectional plan may lead to observations that dropouts and non-dropouts do, indeed, differ, in, say, their attitudes toward their academic programs, one will not be able to state with conviction that they did not differ in important ways before they matriculated in the college.

The analytical procedures brought to bear on cross-sectional data, like those used in evaluating autopsy information, are more a function of the researcher's training and experience than the design selected. Nothing inherent in the basic design requires or proscribes the use of either bivariate or multivariate statis-

tical procedures. Attrition is a complex process, however, and valid and interpretable results are more likely to result from adequate designs and the more powerful multivariate procedures. If the design includes plans to control initial group differences (however limited the available information), multivariate statistical procedures will probably be needed.

The training and experience required of the research staff about to undertake a cross-sectional study can vary considerably. A cross-sectional plan without controls may be as simple and direct as the autopsy design. But if the strengths inherent in the cross-sectional design are to be maximized (particularly controlling for basic pre-college differences), the services of a reasonably experienced researcher will probably be needed.

While only one major data collection is needed, the cross-sectional plan encompasses the hiatus between academic years and, thus, will probably take somewhat longer than the autopsy study to complete. Somewhere between six and nine months may be needed.

The direct costs of adopting a cross-sectional design may be as low as those associated with the autopsy study, but on the average they will probably be somewhat higher. The additional costs are most directly related to the need to sample non-dropouts as well as dropouts, the likelihood (though not necessity) of collecting more information from each respondent, and especially (if controls are to be applied) from the increased clerical and machine costs associated with merging into a single file the survey data and the information from sources other than the respondents (e.g., admissions files).

The research advantage of the cross-sectional design in providing for a comparison group of non-dropouts has its practical counterpart in the opportunities to make use of the data for purposes other than understanding attrition. Dropouts and non-dropouts can be aggregated in order to examine relations between selected student characteristics and various attitudes or behaviors. For example,

one might compare minority and non-minority group students, commuting and resident students, males and females, or students in different academic majors with respect to academic performance, general attitudes toward academic or non-academic programs, or evaluations of policies and services. In brief, the data collected from an attrition study based on the cross-sectional design described here can be made to serve a variety of program, planning, and evaluation purposes.

Finally, as one seeks to control initial group differences (even if only one or two), the amount of planning and the data management problems will increase. Compared to those of a longitudinal design, however, such demands are still relatively slight.

THE LONGITUDINAL DESIGN

A longitudinal design involves the collection of information from the same students at two or more points in time. Under this plan, data on entering students' social and educational backgrounds, expectations of college, educational and career goals and so on are collected prior to (or at the time of) the students' matriculation. Similar data are collected near the end of the academic year from respondents to the initial survey. (Some longitudinal studies run considerably longer than one year; the questions to be answered determine both the timing and number of data collections.) Members of the original sample (or "cohort") who have dropped out at any given point (or perhaps dropped out and returned) are then compared with their non-dropout peers on the variables for which information on the groups is available.

Response rates for longitudinally designed studies, as with cross-sectional designs, are likely to be higher than those obtained in an autopsy study. Indeed, since entering students (either by habit or inclination) are more willing to respond to requests for information than are enrolled students, representativeness of respondents for the population from which they come is most likely for the initial data collection of a longitudinal design. However, since subsequent data

will be collected only from persons who have responded to the initial survey, response rates based on the original sample size will decline as initial respondents fail to respond to subsequent data requests. The problem is peculiar to this design, and it is extremely important to keep this increasing subject "mortality" in mind when determining the original sample size. That sample must be large enough to insure that the estimated response rates for each data collection will yield sufficient respondents with complete data in each analytical group to permit stable analyses. The safest rule-of-thumb is to begin with the largest original sample one can afford.

The cumulative mortality of respondents in longitudinal designs has important implications for the representativeness of persons who have responded to all data requests. Clearly, as the percentage of the original sample declines with each data collection, the prospects for maintaining response representativeness will also decline. The simplest solution to this problem is to make every effort to obtain responses from all members of the original sample or, in subsequent data collections, from all persons who have responded to earlier requests. While the methods of adjusting for any unrepresentativeness which may occur as respondent mortality increases are beyond the scope of this paper, the problem can be a serious one and warrants attention as the study progresses.

As with the cross-sectional design, the longitudinal plan permits comparisons of varying kinds of dropouts with non-dropouts. A longitudinal design has the added advantage, however, of permitting the extensive control of pre-college differences between dropouts and non-dropouts since the initial survey will yield far more information on students' pre-college backgrounds, attitudes and experiences than is likely to be available in the admissions files. For this reason, the longitudinal plan is the most internally valid design of the three. In effect, the pre-college information can be used statistically to equate dropouts and non-dropouts on such characteristics as sex, academic aptitude, high school achievement,

personality traits and expectations of college before the search for "institutional contributions" to attrition is begun (see Kerlinger & Pedhazur, 1973). By comparison with the autopsy and cross-sectional plans, the longitudinal attrition study design is as internally valid as one might hope to find in social science survey research.

As we have seen, however, every design exacts its price. The longitudinal approach may be the most methodologically sound, but it is also the most expensive. Its adoption will require a research staff (or at least one person) with well-developed social science research skills, including familiarity with sampling designs, instrument construction, multidimensional scaling, survey research methodology, and multivariate statistical analysis.

The time needed to complete a longitudinal study is also substantially longer than for either the cross-sectional or autopsy designs; it seems unlikely that a longitudinal study of any shorter duration than one year would provide much useful information on attrition. The time lapse between study initiation and preliminary results in a one-year study can easily take fifteen months.

Direct costs will also be higher for a longitudinal study. The higher price is associated with the need for larger samples and more mailings, increased coding volume, larger numbers of instruments, and computer costs.

Other planning considerations include the increased need for careful study design, instrument development, and sampling design. Depending on the availability of suitable computer software, the data management problems of merging files of unequal sizes can be burdensome. File merging operations that cannot be done by machine will have to be done manually, adding to the time and clerical assistance required.

Institutions that participate in national pre-college student information programs, such as the Cooperative Institutional Research Program (sponsored jointly by the American Council on Education and the University of California at Los Angeles),

or the American College Testing Program's Assessment Program, have a decided advantage over institutions which do not. The availability of pre-college information on students yielded by such programs obviates the need for an additional data collection.

CONCLUSIONS

Both before and after a design is selected, it is important to keep in mind that, without exception, attrition studies are correlational. No causal connections can be made between or among variables and students' attrition decisions. The finding that a given variable is statistically related to attrition is a statement about the likelihood that the observed relation is due to chance; it is not a statement of cause and effect. Identifying causal linkages in the attrition process is, for the present at least, beyond the capabilities of social science research.

While no attrition study design is without its flaws, it seems clear that the autopsy design, from a research point of view, is the weakest design reviewed here. Despite its appealing simplicity and straightforwardness, it simply does not add to understanding of a complex issue: why students drop out. Response rates are typically low, diminishing the likelihood of generalizable results; responses received are open to questions of validity; and provision is typically not made for comparisons of dropouts and non-dropouts, leading to unacceptably low design internal validity. While the autopsy study is the least expensive design and the only one that will permit estimation of the proportion of dropouts who left because they had achieved what they had come for, those assets simply do not counterbalance its conceptual and methodological weaknesses. Probably its only utility is as a supplement to information collected using another design.

The cross-sectional design represents something of a compromise between a research ideal and practical constraints on resources. Compared to the autopsy

design, the cross-sectional plan is more likely to produce acceptable response rates and the concomitant generalizability of results. Comparisons of dropouts and non-dropouts are provided for, as are opportunities to make wider use of the information collected. Relative to the autopsy design, the cross-sectional plan's price takes the form of higher direct costs, a need for a more skilled research staff, and for greater care in planning and study design. (It is less demanding than the longitudinal design in all these respects.) Its principal flaw lies in the lack of opportunities to control for possible pre-college differences between dropouts and non-dropouts; this internal validity weakness can confound the interpretation of results and possibly lead to ineffective administrative action.

From a strictly research point of view, the longitudinal design is clearly the most desirable of the three. Issues of instrument reliability and validity are likely to be less troublesome; response rates are likely to be acceptable (even though they may decline over repeated measurements); and sample representativeness, while it may be a problem, can be dealt with. Comparisons of dropouts and non-dropouts, as with the cross-sectional design, are possible, but with a longitudinal design they can be made under more controlled conditions. The use of multivariate statistical procedures (not precluded from use in cross-sectional studies) are particularly suited to the analysis of longitudinal data and permit careful assessment of the relative importance of institutional features and student experiences and attitudes after controlling for pre-college student characteristics which may, in themselves, influence attrition. Institutional contributions to attrition can be more clearly delineated and assessed when longitudinal data are used. Results will have greater potential for valid interpretation and for wider administrative and planning utility.

These decided research advantages come at a relatively high price, however. Skilled research personnel are needed; the time to complete the study is likely to be fifteen or more months; direct costs will be higher; greater planning will be

required, and data management problems will be greater and more numerous. In the last analysis, of course, it is the investigator and the institution who must strike, and then live with, the balance between design properties and available resources.

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